

IN THE SPECIFICATION:

[0007] For different applications, the alignment film materials can be used in TN type, super-twisted nematic (STN) type, or thin film transistor (TFT) type LCDs. In addition to orientation ability and good coating properties, the pre-tile angle is also important for an alignment film. There are many documented methods for controlling the pre-tilt angle. For example, EP 60485-A EP 0 604 885 A1 discloses utilizing siloxane copolymer materials as alignment film materials and controlling the pre-tilt angle of the alignment film by adjusting the amount of the siloxane. Nevertheless, the materials are merely suitable for wide viewing STN and TFT LCDs. JP 05313169-A discloses a method of controlling the tilt angle of an alignment film by controlling the degree of ring-closing reaction of a polyamic acid solution to form a polyimide. Nevertheless, the method is merely suitable for high pre-tilt angles. JP 07287235-A discloses a method of using a polyimide having a straight chain alkyl group at an end of the polyimide and a polyamic acid having an aliphatic tetracarboxylic acid structure in an alignment film to increase the pre-tilt angle of the alignment film. Nevertheless, this method is only suitable for STN LCD.

[0008] The tilt angle obtained by rubbing a polyimide resin is normally in the range from about 1° to 3° and it is difficult to obtain higher angles. In order to solve this problem, JP Laid-Open Patent Application No. 142099/1987 discloses a liquid crystal alignment film, which comprises a product of the reaction between a long chain alkyl amine and a polyimide resin. By the incorporation of the long chain alkyl, the pre-tilt angle of the alignment film can be increased. However, due to the limited incorporation amount of the long chain alkyl, the increment of the pre-tilt angle is limited. Japanese Laid-Open Patent Application No. 9-

278724/1997 discloses a polyimide resin alignment film comprising a cyclohexane side chain containing a carbonaceous straight chain alkyl. Although the pre-tilt angle of the alignment film can be widely controlled, the cost for preparing the diamine monomers is high.